The experiments and inferences from them are numerous and suggestive. It may be that strict morphologists lay too much stress upon heredity and try to explain too many phenomena as due to recapitulation. It would seem to the reviewer that Professor Goebel has underestimated the importance of heredity as much as most morphologists exaggerate it.

CHARLES J. CHAMBERLAIN

SCIENTIFIC JOURNALS AND ARTICLES

The American Journal of Science contains the following articles: "Some New Measurements with the Gas Thermometer," by A. L. Day and J. K. Clement; "Range of the α-rays," by W. Duane; "Alteration of Augite-ilmenite Groups in the Cumberland, R. I., Gabbro (Hessose)," by C. H. Warren; "Studies in the Cyperaceæ. XXVI. Remarks on the structure and affinities of some of Dewey's *Carices*," by T. Holm; "Applications of the Lorentz-FitzGerald Hypothesis to Dynamical and Gravitational Problems," by H. A. Bumstead.

SPECIAL ARTICLES

ELECTRIC DISTURBANCES AND PERILS ON MOUNTAIN TOPS

IN view of the scientific interest that has been aroused by the sudden death of mountaineers on the widely separated peaks of San Gorgonio and Whitney during apparently the same electric storm in June, 1904,[1] the following recent experience of Captain R. M. Brambila, U. S. Infantry, and the writer will be welcomed as furnishing some hint of the power and magnitude of such electric disturbances.

This experience was endured by the party during the regular visit to the automatic weather observatory maintained by the Nevada Agricultural Experiment Station on Mount Rose (altitude 10,800 feet), the dominating peak north of Lake Tahoe (on the California-Nevada state line), and approximately 200 miles north of Mount Whitney.

The storm, which was mainly electric in nature, displayed itself first on the evening of Friday, October 19, 1907, in a heavy cloud mass lying close along the crest of the Carson Range north of Mount Rose, but in no wise involving Mount Rose itself. The flashes of lightning were frequent and heavy. Little thunder, if any, however, was heard. On the morning of the twentieth, when the actual ascent of Mount Rose began, clouds gathered from the direction of Lake Tahoe about the summit, and enveloped it somewhat persistently during the day. The wind did not exceed ten miles per hour, and the temperature remained above freezing.

From the summit itself the cañons below could be seen filled with masses of vapor. As night darkened a moderate storm of hail and snow with rain began to fall. The pack horse, which had been stabled on a terrace just below the observatory, was covered from tail to ears to protect him from the pelting missiles.

[1] The distance between these peaks, which lie on opposite sides of the Mojave Desert, southern California, is approximately 180 miles and the difference in elevation is 5,015 feet, the higher peak, Mount Whitney (altitude 14,515 feet), being the highest mountain in the United States, excluding Alaska.

The death on San Gorgonio, said to be the first case of the kind in San Bernardino County, occurred July 24, 1904, that on Mount Whitney two days later, July 26. Referring to these fatalities, Professor Alexander G. McAdie, quoted in the *Monthly Weather Review*, September, 1904, page 420, says:

The accidents have a scientific interest in that there are but few records of deaths by lightning in this state. But it should be noted that comparatively few people have been exposed to storms at high elevations. Mr. Byrd Surby was killed on the summit of Mount Whitney, within 50 feet of the monument. It was snowing at the time of the accident. It is probably not well known that the variations in the electric potential of the air during a snowstorm are almost as rapid and as great as those prevailing during a thunderstorm. In this present case I am inclined to think that the electrical disturbance was not localized, but simply incidental to a disturbed field which extended well over the high Sierra, Inyo, Panamint and Telescope ranges; also the San Bernardino Range, and probably the mountains of Arizona. This condition lasted perhaps a fortnight.

Then the electric display began. First a dull detonation to the south, and, after an interval, a flash at the observatory window as if there were wires in the observatory and electricity had struck them. To this we paid little heed, for the occurrence was trivial. After a time, however, a crash a hundred feet below us and perhaps 500 feet away and the immediate terror of the horse drew us to the door.

As we emerged, every artificial projection on the summit was giving forth a brush discharge of electricity. The corners of the eaves of the observatory (covered with Malthoid roofing), the arrow of the wind vane, the cups of the anemometer, each sent forth its jet, while the high intake pipe of the precipitation tank on the apex of the summit was outlined with dull electric fire.

Whenever our hands arose in the air, every finger sent forth a vigorous flame, while an apple, partially eaten, in the hand of Captain Brambila sent forth two jets where the bite left crescent points. This latter phenomenon occurred, however, only when the apple was raised above the head and ceased when it was lowered so that the eating of the apple involved no visible eating of flame.

To cap the climax my felt hat above the brim flashed suddenly into flame. I could feel the draft and, it seemed to me I could hear it too. The halo was dazzling, but before the senses could react it was gone. I had earlier but ineffectually rubbed Captain Brambila's hair to elicit a discharge of electricity, but because he was diminutive in size, nature had selected me to serve as the point of electric discharge. So vivid were the flames that continued to play from the corner of the observatory that I reached up to assure myself that the observatory was not actually on fire.

We felt no ill physical effects nor any special alarm, but for prudence's sake we sought the interior of the observatory, where the pranks of the electricity were apparently completely avoided. About 7:30 o'clock, an hour after the electric storm had burst, it had vanished.

The clouds, however, continued to hover around the summit, and the following evening a heavy rainstorm swept from the mountain earthward toward Reno, gaining violence as it descended, until the valley was drenched. We followed the storm closely with but little inconvenience from rain.

Only once before have I met electricity actively present on Mount Rose. This was during daylight of June 25, 1906, in a wet snowstorm accompanied by dense fog. At that time the thunder was pealing in the abyss below me, until I felt like some Jupiter hurling thunderbolts at the earth beneath.

The puzzle is that the tension did not burst on the apex of the summit where the discharge of earth electricity had particularly ionized the air, instead of upon the rocks below. A possible reason may be found in the suggestion of Dr. R. S. Minor that the scud which was sweeping between the heavier clouds above and the mountain mass may have become electrified by passing between the two poles and then have discharged its electricity as it was swept down nearer the mountain where the air currents swirl in its lee.

So far the discharges on Mount Rose have occurred at this lower point, and this habit may prove to be the observatory's security. The large extent of the summit over which the brush discharge was active, and the intensity of the latter, indicate imminent danger to the entire observatory. It was believed, when the observatory was planned, that the bolt would be induced to strike the high intake pipe of the precipitation tank on the crest; but such a conductor, it seems, would prove insignificant on account of the gigantic proportions of the electric activity. Besides, it is impossible to create a satisfactory circuit from tank to mountain, for the summit is apparently one mass of shivered rocks whose interstices are filled only with dry earth.

A wire cage in which to sit during thunderstorms has been suggested as affording possible immunity for the observers. It is possible that the observatory itself, which is sheathed with Malthoid roofing above and nested in the rocks below, may serve the same

purpose. The placing of wire netting around the louvered shelter where the meteorograph is installed might give this instrument protection from electric shock, but the projection of the wind vane and anemometer masts from the shelter may attract sufficient electricity to fuse the netting and reach the instrument by way of the mechanical connections. There has been actual danger on Mount Rose, so far as known, only this single time during the past three years.

J. E. CHURCH, JR.
UNIVERSITY OF NEVADA,
RENO, NEVADA

THE BLOWING OF SOILS

WHEN a boy on my father's farm in Iowa I experienced a three days' dust storm, when the air was so full of dust that one could hardly see, and the sun was almost obscured. After the storm I noticed that drifts of loose earth had accumulated in all the protected hollows, in the lee of corn shocks and fences, and on the grass lands adjacent to the cultivated fields. We had no other storm so severe as this one, but I noticed that the drifting soil particles in the air were gradually filling up a small pond that adjoined a plowed field. This little pond was so situated that no wash from the plowed area could enter it, and its filling up was undoubtedly due to the deposition of wind-blow particles. Some years ago I again visited the place and found that this pond was dry and filled up practically level with the surrounding land.

In the spring of 1889 I had occasion to observe the erosion by the wind of a recently plowed field on my father's farm, near Yates Center, Kan. The field sloped gently toward the southwest, and for several days the wind blew violently from that direction, carrying away the soil in some of the most exposed places to the full depth to which it had been loosened by plowing. Most of the soil was, of course, dropped in the lee of the first obstruction; but the finer particles were probably carried for many miles. Other fields in the vicinity suffered the same fate, and after the storm was over our neighbor adjoining us on the north had the bulk of our soil. Most of it was piled in big drifts just back of an osage hedge.

Later, near Albuquerque, N. M., and at Cibicu, Ariz., I was impressed by the strong indications of eolian origin offered by the adobe clay of this region. This material can hardly have been formed by glacial action as no traces of such can be found, and fluvial action is in most cases excluded by the topography. The deposit is found superimposed on many geologic formations and at a wide range of altitudes. It may be partly rain wash from the hills, but were it entirely so it would show a non-uniformity of mechanical composition—becoming finer in grain with distance from the hills. This does not occur—the deposit being very uniform. It is also remarkably level, showing no traces of the descending slopes characteristic of alluvial fans. Becoming convinced that this deposit was largely of eolian origin, I began to look about for evidences that deposits are made and materials moved by the wind. The following observations resulted:

1. On the Jemez coal lands near Albuquerque, N. M., it was noticed that, on windy days, a sheet of dust was continually blown completely over the region from Mesa Blanca and adjacent ridges.

2. At Cibicu, Ariz., fine dust settled on anything spread on the ground after a reddish southwestern sky at sunset, indicative of dust storms in the Gila-Salt River desert many miles away. This happened even when there was apparently no wind at Cibicu during the previous night and the day.

3. During a year of very slight rainfall at Fort Apache, Ariz., the adobe flats received even more increment than in years when the rainfall was normal. In this region the soil particles are continually being blown to the eastward from the region to the south of the long tongue-like ridge of the Mogollon range which extends to within a few miles of Fort Apache, and the dirt is being collected in the grass-covered area to the leeward of this ridge, but so slowly that the growth of vegetation keeps pace with the deposition.

4. The accumulation of wind-blown earth is